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Hernandia sonora L. Mago, Toporite

Hernandiaceae Hernandia family

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Hernandia sonora L., usually referred to as mago in Puerto Rico, is also known as toporite (Trinidad and Tobago), aguacatillo (Costa Rica), palo de campana (Mexico), and tambor (Guatemala). Mago is a handsome tree that has heart-shaped, peltate leaves with a distinctive purple spot opposite the petiole attachment. The tree develops straight, clean boles, a silver-gray bark, and open crowns (fig. 1).

HABITAT

Native Range

The native range of mago extends through the Greater and Lesser Antilles and on the mainland from southern Mexico through Costa Rica *(4, 8,* fig. 2). In Central America, mago is mostly confined to valleys and hills near the Atlantic coast. Although widespread, the species' distribution tends to be localized and not very abundant in any area *(4, 6)*.

Climate

Mago can grow in a wide range of climatic conditions. Natural stands tend to be found along rivers, streams, and at the margins of swamps *(6)*. With proper weed control, planted magos have been successfully grown in areas with as little as 1500 mm of mean annual precipitation (MAP). Naturally regenerated trees in Puerto Rico flourish with over 3000 mm MAP. Most areas where mago grows naturally lie within this range of precipitation and have a short winter dry season each year. Temperatures are seldom less than 15°C or greater than 35°C, and frosts are unknown.

Soils and Topography

The largest documented mago trees in Puerto Rico are growing on very strongly acid, bouldery clay inceptisols along a small stream. Plantations have been successful on soils with textures from loam to clay and with pH's from 4.5 to 7.5. In Trinidad, mago is found on moist sands and clays *(6)*. Natural stands most often grow on lower slopes *(4)* and on stream banks.

Associated Forest Cover

In Trinidad and Tobago, mago is most commonly found in the *Carapa guianensis* Aubl.—*Lecythis laevifolia* Griseb. forest type *(6)*. In the medium- and high-subevergreen forests of Mexico, upper story associates of mago are *Brosimum alicastrum* Sw., *Mirandaceltis monoica* (Hemsl.) Sharp, *Bursera simaruba* (L.) Sarg., *Dendropanax arboreus* (L.) Decne. and Planch., *Manilkara zapota* (L.) v. Royen, and *Carpoditera ameliae* Lundell *(7)*. As a riparian tree in pasture lands in Puerto Rico, it may be found with *Terminalia catappa* L., *Erythrina glauca* Wild., *Cassia siamea* Lam., *Eugenia jambos* L., *Guarea guidonia* (L.) Sleumer, and *Mangifera indica* L.

Figure 1.—*A 26-year-old mago tree grown in a Puerto Rican plantation.*

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LIFE HISTORY

Reproduction and Early Growth

Flowering and Fruiting.—Mago produces small greenish-white or gray colored flowers borne on large (13- to 20-cm long) cymes *(4)*. Male and female flowers occur separately in the same inflorescence *(6)*. Flowering takes place in January in Trinidad and Tobago *(6)* and June in Puerto Rico, and there appears to be up to several weeks' variation in flowering and fruiting dates within and between stands. The fruits ripen 5 to 7 months after flowering. Each fruit is a hard, black, 2- to 2.5-cm drupe with eight longitudinal ridges enclosed in a bladderlike, fleshy yellow calyx that has the distinct odor of ripe apples *(4, 6)*.

Seed Production and Dissemination.—The precise age at which mago begins yielding seed is not known, but dominant and codominant trees were producing seeds by age 9 in a Puerto Rican plantation. The seeds are not borne in huge numbers—10 to 100 seeds per medium-sized tree per year is typical. Three samples of air-dried seeds from different stands in Puerto Rico averaged 363.2 ± 2.4 seeds per kilogram. Seeds normally fall and germinate directly under the parent trees, and seedlings generally are abundant under mago trees. However, seeds are dispersed by water and by animals that occasionally eat the fleshy calyx and seeds.

Seedling Development.—The seeds of mago germinate hypogeally *(6)*. Germination is slow, beginning about 5 weeks after planting and continuing for another 6 weeks. A test in Trinidad and Tobago *(6)* gave 10-percent germination, and two tests in Puerto Rico gave 32- and 56-percent germination. Germination appears best on fairly wet media such as peat. Emergence was about equal from half-exposed and lightly covered seeds.

The emerging stem elongates 10 to 15 cm before producing the first leaf *(6)*. The seedling leaves are green to yellow green and have the adult leaf shape. A height of 45 cm may be achieved during the first growing season.

Good growth in nursery containers has been obtained under 50 percent artifical shade. However, under natural conditions with moderate overhead shade, most of the seedlings die after reaching a 20- and 30-cm height. Because seedlings in plantations survive well, it seems probable that naturally regenerated understory seedlings would develop after release from overhead shade if the operation were conducted while the seedlings were still strong and healthy. Another possible mode of natural regeneration would be to harvest just after seedfall. Unfortunately, the only form of regeneration reported so far has been by planting seedlings that have been grown in plastic nursery bags. Some follow-up weeding is required in the first 2 or 3 years with this method, but no significant problems have been encountered. In one small plantation in Puerto Rico, 94 percent of the trees planted were still alive after 26 years.

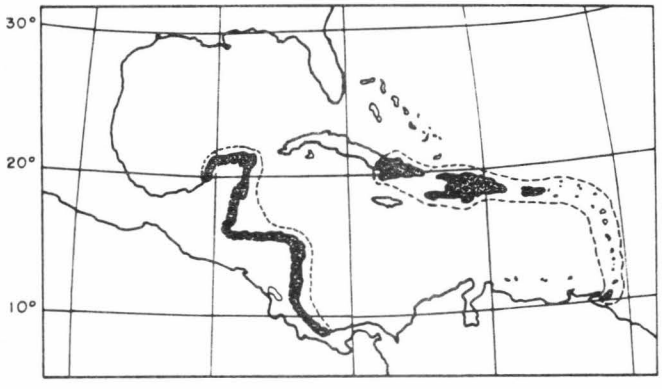

Figure 2.—*The approximate natural range of mago in Central America and the Caribbean.*

Vegetative Reproduction—Young mago will coppice, but large, old trees will not *(6)*.

Sapling and Pole Stage to Maturity

Growth and Yield.—Although the growth of mago is not as rapid as that of *Eucalyptus* spp. or *Pinus caribaea* Morelet, mago grows faster than many of the native species in Puerto Rico. In Trinidad and Tobago, seedlings may reach 1.8 m in 3 years *(6)*. In Puerto Rico, the 3-year height of a plantation on a good upland site was 3 m. By age 9, the dominant trees on the same site had reached a 16-m height and 13-cm diameter at breast height (d.b.h.). A small 26-year-old plantation in a high rainfall (3000 mm/yr) upland area averaged 18 m in height and 25.7 cm in d.b.h. (table 1). Excluding two border rows, it had a standing volume equivalent to 301 m^3/ha and an average production of 12 m^3/ha/yr. None of the plantations were on the best sites for mago. Natural stands near streams in Puerto Rico often contain individuals with heights of 35 m or more and d.b.h.'s of a meter or more.

Rooting Habit.—Seedlings and saplings of mago produce robust, fleshy taproots and laterals. Large trees develop massive, near-surface lateral roots and small buttresses.

Reaction to Competition.—Mago is moderately intolerant of shade as an adult and as a seedling *(6)*. Although the vast majority of seedlings under the parent stand die in a few months, occasional individuals continue to grow, eventually penetrating the canopy. Mago has relatively few leaves and does not cast dense shade. Basal areas of 16.8 m^2/ha and 11.5 m^2/ha were observed, respectively, in a plantation and a natural stand in Puerto Rico. The average crown ratio (crown diameter/d.b.h.) in three Puerto Rican stands was 21.6. Mago differentiates into crown classes gradually, and suppressed individuals remain as part of the stand for several years before they die; this crowding results in slow diameter growth. Attractive features of the species are rapid early self-pruning, lack of epicormic branches, and small taper. Boles generally grow straight but are subject to sweep in dense stands.

Damaging Agents.—No insect pests or diseases have been noted for mago in the literature; butt and heart rots have not been observed either. The lumber, however, is very susceptible to dry-wood termites, marine borers, and decay *(5)*.

SPECIAL USES

The wood of mago is ivory to gray in color with promi-

Table 1.—*Mean diameter and height and the height of the tallest tree for stands of mago in Puerto Rico.*

Location	Sample size	Age	Mean d.b.h.*	Mean height*	Maximum height
	No.	*Years*	*Cm*	*m*	
Plantations					
Arboretum	46	26	25.7 ± 1.4	18.3 ± 0.6	24.0
Sabana	66	26	16.6 ± 2.0	17.4 ± 2.1	24.5
Cambalache	36	23	19.3 ± 3.2	16.8 ± 2.8	23.5
Natural stands					
Rio Mameyes	5	unknown	67.8 ± 4.3	19.2 ± 1.7	25.5
Colinas del Yunque	33	unknown	51.7 ± 5.2	25.4 ± 1.5	40.0
Catalina	18	unknown	53.9 ± 6.6	25.0 ± 2.2	39.0

*Mean ± standard error of the mean.

nent brown pores, somewhat resembling balsa *[Ochroma pyramidale* (Cav.) Urban]. The sapwood and heartwood are indistinguishable *(5).* The wood is straight grained with low luster. A cross section from a freshly cut tree contained 99 percent moisture (weight of water/dry weight of wood). The wood dries rapidly with only minor degrade. Shrinkage is moderate and uniform (1.4 percent radially and 2.4 percent tangentially). Samples of three trees ranged in specific gravity (oven-dry weight/green volume) from 0.28 to 0.37 g/cm^3 (averaging 0.32 g/cm^3). Longwood *(5)* reports that air-dried wood weighs 0.336 g/cm^3.

Mago works easily with hand or power tools. It does have a tendency to fuzz during planing and sawing and is reported to dull cutting edges rapidly *(4).* Mago wood takes nails and screws without splitting but finishes poorly. The wood is used to a limited extent for boxes, fishing floats, and interior construction lumber. Logs have been used by natives for dug-out canoes. Low-density hardwoods are being used increasingly to manufacture structural particle board *(10);* perhaps mago, combined with other low-density tropical hardwoods, will someday be used in a similar manner.

Mago is not often planted as a shade tree. Although it has handsome leaves and colorful fruit, the large, near-surface roots of older trees could be a problem for sidewalks. In the past, leaf extracts had a considerable reputation as a depilatory *(9,11),* and the seed and bark have been used for purgatives, laxatives, and in treating diarrheal infections.

GENETICS

There are 24 species of *Hernandia* scattered through tropical America, West Africa, and Indo-Malasia *(2).* Mago is closely related to, and in the past was not considered as being distinct from, *H. guianensis* Aubl. of northern South America *(4)* and *H. catalpifolia* Britton and Harris of Jamaica *(1).* No hybrids have been reported. In some parts of the natural range the species appears as only a small tree or shrub *(3),* but it is not known whether this is a result of genetics or because the sites are unsuitable.

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